Trade margins and exchange rate regimes: new evidence from a panel VAR

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Trade margins and exchange rate regimes: new evidence from a Panel VAR

Lilia Cavallari* Stefano D'Addona†

Abstract

This paper studies how trade margins respond to output and terms of trade shocks in different exchange rate regimes within a panel of 23 OECD economies over the period 1988-2011. Using a panel VAR model, we confirm the predictions of entry models about the behaviour of export margins over the cycle. In addition, we find remarkable differences depending on the exchange rate regime. We document that fixed exchange rates have a positive effect on the extensive margin of trade in response to external shocks while flexible exchange rates have a pro-trade effect in response to output shocks. Our results imply that as long as extensive margins are a relevant portion of trade and external shocks are a major source of business cycle variability, the stabilization advantage of flexible exchange rates may be lower than previously thought.

Keywords: trade margins, international business cycle, Panel VAR model, exchange rate regimes.

JEL codes: E31; E32; E52

*Lilia Cavallari, Department of Political Science, University of Rome 3, Via Chiabrera, 199, 00145 Rome, Italy, email: lilia.cavallari@uniroma3.it.

†**Corresponding author**. Department of Political Science, University of Rome 3, Via G. Chiabrera, 199, I-00145 Rome; +39-06-5733-5331; daddona@uniroma3.it.

1 Introduction

This paper studies how trade margins respond to domestic (output) and external (terms of trade) shocks in different exchange rate regimes. In particular, we test the predictions of entry models about the behaviour of trade margins over the business cycle using a panel VAR approach. For this purpose, we consider intensive and extensive margins of exports together with real GDP and the terms of trade in 23 OECD economies over the period 1988-2011.

Our contribution is twofold. First, our study provides new evidence on the stabilization properties of flexible exchange rates. Since Friedman (1953), an advantage typically attributed to flexible exchange rate regimes over fixed regimes is their ability to insulate the economy against real shocks. In a world with sticky prices, changes in the nominal exchange rate allow for larger movements in relative prices that help to smooth adjustment of output to real shocks. Advocates of fixed exchange rates, on the other side, stress that exchange rate uncertainty may discourage trade flows. One of the major reason for adopting fixed exchange rates in the first place is their ability to promote trade.[1] We find that the responses of trade margins support the stabilization argument in the wake of output shocks. Impulse responses to terms of trade shocks, instead, are consistent with the pro-trade argument in favour of fixed exchange rates.

Second, the paper provides a first attempt to bring to the data the predictions of business cycle models with firm entry.[2] A major implications of these models is that business formation has the potential to alter the transmission of shocks along a number of dimensions. In open economies, a common finding is that a domestic

[1] Despite a long history of failures to find a robust relation between exchange rate variability and trade, Rose (1999) has revived the debate by showing that the adoption of a currency union raises bilateral trade by a large amount. Subsequent research has supported the statistical significance, if not the magnitude of this result.

[2] Since the seminal study of Melitz (2003), a number of papers have investigated the implications of entry for the international business cycle. Open economy models with firm entry include, among others, Bergin and Glick (2007), Ghironi and Melitz (2005), Cavallari (2007, 2010, 2013) and Corsetti et al. (2007, 2013).

cyclical expansion, typically driven by a rise in aggregate productivity, leads to an increase in the number of goods exported (the extensive margin of export). We should therefore observe a positive response of extensive margins to output shocks. The effect on the volume of trade for incumbent exporters (the intensive margin of exports) is a priori ambiguous: the advantage of a productivity boost may be offset by tougher competition in export markets. The debate is still open on the implications of entry for the international business cycle. Most models in this area have the unappealing consequence of implying negative correlations of output, consumption and investments among countries in contrast to what found in the data. A notable exception is Cavallari (2013) who shows that entry can indeed provide a channel for positive comovements. In her model, an appreciation of a country's terms of trade leads to a fall in the entry costs faced by potential exporters, thereby stimulating investments in new varieties. We should therefore observe a positive response of the extensive margin of exports to a terms of trade improvement. As before and for analogous reasons, the effect of a terms of trade shock on intensive margins is ambiguous.

We start by providing some new facts about the behaviour of trade margins over the cycle. Three facts stand out. First, trade margins and export shares are less volatile than GDP and almost a-cyclical. Second, the volatility of extensive margins is lower and their correlation with output is higher in countries that adopt fixed exchange rates (peggers) compared to countries with flexible exchange rates (floaters). Third, the volatility of intensive margins and export shares is almost identical in the sample of peggers and in the sample of floaters.

Then, we investigate the empirical behavior of export margins, GDP and the terms of trade under fixed and floating exchange rate regimes. Using a panel VAR approach, we confirm the predictions of entry models about the response of external margins to output and terms of trade shocks. In addition, we find remarkable differences depending on the exchange rate regime. A terms of trade improvement

leads to an increase in the extensive margin of exports that is more than three times as large in countries that adopt fixed exchange rates compared to countries with flexible exchange rates. The response to output shocks, on the contrary, is significantly lower for peggers than for floaters. A different picture emerges for trade at the intensive margin. Intensive margins are mainly driven by their own innovations. Moreover, their responses are almost identical in the sample of peggers and in the sample of floaters.

Two conclusions may be drawn from our analysis. First, our findings confirm recent studies documenting that the pro-trade effect of fixed exchange rates occurs mainly along the extensive margin of trade (Bergin and Lin, 2012). Second, we find that this effect is particularly strong in the face of a terms of trade shock. Flexible exchange rates, on the other side, appear to have a pro-trade effect in response to output shocks. Overall, our results imply that as long as extensive margins are a relevant portion of trade and external shocks are a major source of business cycle variability, the stabilization advantage of flexible exchange rates may be lower than previously thought.

The remainder of the paper is organized as follows. Section 2 describes our dataset and provides some new facts about trade margins. Section 3 presents our VAR model and the main results. Section 4 concludes.

2 Trade margins and the business cycle

The trade channel is at the heart of the international business cycle. Recent models with firm entry have stressed that changes in trade flows may alter the transmission of shocks worldwide depending, among other things, on whether these changes take place at the intensive or at the extensive margin. As will be clear soon, the extensive margin reflects changes in the number or type of goods traded. The intensive margin measures changes in the volume of trade in a category of goods for which trade relations are already present. Yet, our knowledge of the behaviour of trade margins

over the cycle is still limited. In this section, we document some new facts about export margins and export shares.

2.1 Data

We use a panel dataset of annual observations for 23 OECD countries over the period 1988-2011. In what follows, we will classify countries as "peggers" and "floaters" according to the exchange rate regime they adopt. As in Born et al. (2013), the peggers are countries with an exchange rate regime of "pegged within horizontal bands" or tighter. Remaining countries are considered as floaters.[3]

Macroeconomic data (GDP and exchange rates) are from the OECD StatExtracts database. Trade data (exports, imports, and terms of trade) are from the IFS-IMF database or the World Bank Data upon availability. The terms of trade are defined as the price of a country's exports towards the world divided by the price of its imports from the world. An increase in the terms of trade is therefore an appreciation. All variables are in real terms and are logged, except net exports which are divided by the GDP.

Trade margins are from the UN Comtrade Data Set. The margins are calculated using the World Integrated Trade Solution developed by the World Bank which computes annual bilateral trade measures at the four-digit Standard International Trade Classification.[4]

Following Hummels and Klenow (2005), we define the extensive margin of exports from country j to country m as:

$$XM_m^j = \frac{\sum_{i \in I_m^j} X_{m,i}^W}{X_m^W} \tag{1}$$

where $X_{m,i}^W$ is the export value from the world to country m of category i, I_m^j is the set of observable categories in which country j has positive exports to country

[3]It is worth noting that this classification gives an identical sample split as the one based on the IMF "de jure" classification.

[4]http://wits.worldbank.org/wits/

m, and X_m^W is the aggregate value of world exports to country m. The extensive margin can be interpreted as the weighted sum of country j's exported categories relative to all categories exported to country m, using their relative importance in world's exports to country m as weights.

Similarly, the intensive margin of exports from country j to country m is defined as:

$$IM_m^j = \frac{X_m^j}{\sum_{i \in I_m^j} X_{m,i}^W} \tag{2}$$

where X_m^j is the total export value from country j to country m. The intensive margin is the value of $j's$ export relative to the weighted categories in which country j exports to country m.

Using the above definitions, the country $j's$ share of world exports to country m is given by:

$$EXSh_m^j = \frac{X_m^j}{X_{m,i}^W} = XM_m^j IM_m^j \tag{3}$$

The above measures are interpreted as follows: a country j with a high extensive margin exports many different categories of products to country m, whereas, the same country j has a high intensive margin if it exports only few categories of products to country m.

2.2 Descriptive statistics

Table 1 provides descriptive statistics for export margins and export shares. Export margins are less volatile than output in all countries except the United States as are export shares. The average volatility of extensive (intensive) margins is lower than that of GDP by a factor of 0.44 (0.06) on average. Extensive and intensive margins, and export shares are a-cyclical in most of the countries in our dataset: the average correlation with output is, respectively, equal to 0.11, 0.02 and 0.06.

Table 1: Trade Margins

This table reports key statistics for trade margins in 23 OECD countries over the period (1988-2011). The first three columns report the ratio of the standard deviation of trade margins to the standard deviation of GDP while the last four columns report their correlations with GDP.

	RATIO TO GDP			CORRELATION WITH GDP		
Country	Ext. Margin	Int. Margin	Ex. Share	Ext. Margin	Int. Margin	Ex. Share
Australia	0.352	0.047	0.041	0.040	0.046	0.044
Belgium	0.334	0.033	0.029	0.196	0.044	0.108
Canada	0.770	0.136	0.134	-0.116	-0.227	-0.227
Czech Republic	0.221	0.026	0.019	-0.023	-0.074	-0.067
Denmark	0.332	0.053	0.044	0.189	0.062	0.160
Finland	0.236	0.043	0.029	0.163	-0.026	-0.013
France	0.323	0.035	0.031	0.261	0.115	0.195
Germany	0.276	0.028	0.027	0.364	0.117	0.203
Iceland	0.331	0.097	0.055	0.208	-0.050	0.080
Italy	0.406	0.029	0.025	0.159	-0.001	0.068
Japan	0.482	0.060	0.048	0.120	0.117	0.150
Korea, Rep.	0.279	0.034	0.026	0.199	-0.084	0.000
Luxembourg	0.554	0.158	0.083	-0.131	0.110	0.076
Mexico	0.201	0.075	0.043	0.114	0.057	0.072
Netherlands	0.363	0.037	0.030	0.015	0.097	0.097
New Zealand	0.270	0.043	0.034	0.226	0.071	0.110
Norway	0.405	0.071	0.054	0.104	0.038	0.063
Portugal	0.469	0.091	0.063	-0.123	0.085	0.057
Spain	0.382	0.043	0.035	0.342	-0.120	0.040
Sweden	0.220	0.029	0.025	0.153	0.046	0.104
Switzerland	0.400	0.063	0.047	0.021	0.162	0.193
United Kingdom	0.316	0.041	0.035	0.045	0.084	0.103
United States	2.218	0.155	0.129	-0.062	-0.217	-0.242
Mean	0.441	0.062	0.047	0.107	0.020	0.060
Volatility	0.407	0.040	0.030	0.140	0.105	0.114

Moreover, the volatility of extensive margins is lower among peggers than among floaters in a one-side test at the 5 percent level (cf. table 2). The correlation with output of export margins and export shares, on the contrary, is higher for peggers than for floaters. There is no remarkable difference between peggers and floaters as long as the volatility of intensive margins and export shares are concerned.

2.3 Preliminary tests

A key assumption for the identification strategy used in the next section is the exogeneity of the terms of trade in the sample under study. In principle, the assumption is justified for small open economies on the ground that they are price-takers in world markets. Large economies, on the contrary, are expected to exert a non-negligible influence on world prices. In practice, however, we will soon show that only a small fraction of countries in our sample effectively exert such an influence. This, in turn, suggests that the bias eventually introduced by assuming exogenous terms of trade is small.

We test the hypothesis that trade margins and GDP Granger cause the terms of trade for all countries in our sample using the test developed by Dumitrescu and Hurlin (2012) for panel data.[5] Trade margins do not Granger cause the terms of trade in almost all panels: the null hypothesis of no Granger causality could not be rejected in approximately 87% of the countries (20 out of 23 countries) when both the extensive and the intensive margin are considered. Results are less clear-cut for GDP where the null of no Granger causality could not be rejected in 67% of the countries (13 out of 23 countries). Among major economies, only Canada, Germany and Japan appear to exert a significant influence on the terms of trade. Our results are robust to the exclusion of these countries.

We test for the stationarity of the endogenous variables in the VAR (real GDP, terms of trade and trade margins) using a panel unit root test based on the method

[5]The complete set of test results, not reported here, is available upon request.

Table 2: Peggers and Floaters

This table reports key statistics for trade margins in the sub-samples of peggers and floaters. The classification of the exchange rate regimes is based on Born et al. (2013). The first three columns report the ratio of the standard deviation of trade margins to the standard deviation of GDP while the last three columns report their correlations with GDP.

	PEGGERS					
	RATIO TO GDP			CORRELATION WITH GDP		
	Ext. Margin	Int. Margin	Ex. Share	Ext. Margin	Int. Margin	Ex. Share
Mean	0.381	0.061	0.051	0.147	0.154	0.225
Volatility	0.130	0.034	0.024	0.205	0.145	0.142
	FLOATERS					
	RATIO TO GDP			CORRELATION WITH GDP		
	Ext. Margin	Int. Margin	Ex. Share	Ext. Margin	Int. Margin	Ex. Share
Mean	0.444	0.062	0.045	0.110	-0.023	0.014
Volatility	0.407	0.044	0.031	0.132	0.104	0.106

proposed by Levin et al. (2002). In the full sample, Augmented Dickey Fuller tests could not reject the existence of a unit root in the series of GDP and terms of trade. The null of no stationarity could be rejected at a very high significance level in the series of both trade margins.

Finally, we performed panel cointegration test for the non-stationary variables in the VAR, namely GDP and terms of trade. According to the Westerlund ECM panel cointegration test, the null of no cointegration could not be rejected against the alternative that a cointegrating relation between GDP and terms of trade exists for at least one country in the sample. Consequently, estimating the VAR model in first differences for GDP and terms of trade without imposing any cointegrating relation between these two variables is a good approximation. For all panels, the Akaike Information criterion suggests either including two or three lags. We use a parsimonious two lag specification for our VAR, though we checked that using only one or up to three lags would not lead to different conclusions.

3 Empirical model and results

3.1 Panel VAR

This section models the empirical behaviour of export margins (extensive and intensive margins, EM and IM, respectively), real GDP (GDP), and terms of trade (TOT) in countries with different exchange rate regimes. We specify the panel VAR model as follows:

$$Y_{it} = A_0 + A(L)Y_{it} + f_i + d_t + u_{it} \tag{4}$$

where Y_{it} is a vector of stationary endogenous variables $Y_{it} = (\Delta TOT_{it}, \Delta GDP_{it}, EM_{it})$ or $Y_{it} = (\Delta TOT_{it}, \Delta GDP_{it}, IM_{it})$, $\Delta = (1 - L)$ indicates the first difference of a variable, $A(L)$ are matrix polynomials in the lag operator of order 2, f_i are country fixed effects, d_t are country-specific time dummies, u_{it} are the structural errors and

$var(u_{it}) = \Omega$.

The dynamic responses of Y_{it} to the structural shocks can be identified once A_0 and Ω are recovered from the reduced form estimation. Identification is achieved by assuming a contemporaneous recursive ordering where the variables are ordered as given in the definition of Y_{it}. This entails the assumption that the terms of trade are exogenous and trade margins are the most endogenous variable in the system. Therefore, the terms of trade can react contemporaneously to innovations in both output and export margins, output shocks can affect the terms of trade only with a lag and innovations to trade margins can affect the other two variables only with a lag.[6] The exogeneity of the terms of trade in our dataset is addressed in the preceding section. The endogeneity of trade margins may in principle be justified by the fact that trade margins reflect exporters' investments (at the intensive or at the extensive margin) and these are likely to affect output with some delay. In business cycle models with firm entry, investments typically entail a time-to-build lag. In practice, the recursive ordering in our VAR model has no implications for the qualitative properties of the estimated impulse responses.

Our main interest is to compare the responses of export margins in countries with different exchange rate regimes. For this purpose, we split our sample into two groups according to the classification of the exchange rate regime described in the preceding section. In particular, the sample of "peggers" includes all the country pairs that share a fixed exchange rate regime (i.e., to be included among the peggers both countries must adopt a fixed exchange rate regime in our classification), while the sample of "floaters" includes the pairs with a flexible exchange rate (i.e. to be included among the floaters at least one country must adopt a flexible exchange rate regime in our classification). We test for differences in the impulse responses in the two samples using a bootstrapping strategy as in Born et al. (2013).

In our specification, we include the fixed effects f_i so as to account for "individual

[6]Our identification restrictions imply that the coefficients a_{12}, a_{13}, a_{14}, a_{23}, a_{24} and a_{34} of A_0 are equal to zero.

heterogeneity" in the level of the variables. Since fixed effects are correlated with the regressors through the lags of the dependent variables, the usual mean-differencing procedure would provide biased coefficients. To avoid this problem we use forward mean-differencing, also known as the Helmert procedure (see Arellano and Bover, 1995). This procedure removes the forward mean, i.e. the mean of all the future observations available for each country and year. Since this transformation preserves the orthogonality between transformed variables and lagged regressors, we use lagged regressors as instruments and estimate the coefficients by system GMM (Love and Zicchino, 2006).[7]

Finally, we consider country-specific time dummies, d_t, as a means to capture business cycle shocks which may affect all cross-section units at the same time. In the estimation, we will eliminate these dummies by subtracting the mean of each variable calculated for each country and year.

3.2 Results

Table 3 reports the estimated coefficients and the standard errors for the model in equation (4) with extensive and intensive margins respectively. Confidence intervals are generated by Monte Carlo simulations with 500 replications.

Consider first external shocks as represented by a one standard deviation increase in the terms of trade. The improvement in the terms of trade leads to an increase in extensive margins in the full sample (Figure 1). The effect is high on impact, equal to 0.25% on average, and then gradually declines before becoming negligible after three years. The fact that the improvement in a country's terms of trade is associated with an increase in the variety of goods it exports confirms the predictions of entry models as Cavallari (2013). In her model, the appreciation of the terms of trade reduces the costs of importing materials required for the setup of a new

[7]Note that in our model the number of regressors coincides with the number of instruments (i.e., the model is just-identified) so that system GMM is equivalent to a 2SLS estimation equation by equation.

Table 3: Impulse responses

This table reports impulse responses to unanticipated shocks for the VaR model in equation (4). The VaR is estimated on the whole sample of 23 OECD Countries (1988-2011). Confidence intervals are 95% generated by 500 MonteCarlo replications.

Panel A: Impulse Responses of Extensive Margins

Periods	0	1	2	3	4	5	6
	One Standard deviation shock to Terms of Trade						
5th Pct.	0.0019	0.0006	-0.0001	0.0001	0.0001	0.0001	0.0001
Response	0.0025	0.0013	0.0008	0.0006	0.0005	0.0004	0.0004
95th Pct.	0.0030	0.0020	0.0016	0.0011	0.0009	0.0008	0.0007
	One Standard deviation shock to Output Growth						
5th Pct.	0.0038	0.0020	0.0002	-0.0001	0.0001	0.0002	0.0002
Response	0.0044	0.0027	0.0009	0.0005	0.0006	0.0006	0.0005
95th Pct.	0.0050	0.0035	0.0017	0.0012	0.0011	0.0009	0.0008
	One Standard deviation shock to Extensive Margins						
5th Pct.	0.0330	0.0178	0.0168	0.0128	0.0104	0.0083	0.0067
Response	0.0334	0.0187	0.0176	0.0138	0.0114	0.0093	0.0077
95th Pct.	0.0338	0.0196	0.0184	0.0147	0.0124	0.0103	0.0086

Panel B: Impulse Responses of Intensive Margins

Periods	0	1	2	3	4	5	6
	One Standard deviation shock to Terms of Trade						
5th Pct.	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
Response	0	0	0	0	0	0	0
95th Pct.	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	One Standard deviation shock to Output Growth						
5th Pct.	-0.0001	-0.0003	-0.0005	-0.0004	-0.0003	-0.0003	-0.0002
Response	0	-0.0002	-0.0004	-0.0003	-0.0002	-0.0002	-0.0001
95th Pct.	0.0001	0	-0.0002	-0.0002	-0.0001	-0.0001	-0.0001
	One Standard deviation shock to Intensive Margins						
5th Pct.	0.0064	0.0034	0.0034	0.0026	0.0022	0.0018	0.0014
Response	0.0064	0.0039	0.0036	0.003	0.0025	0.0021	0.0018
95th Pct.	0.0065	0.0044	0.0039	0.0033	0.0029	0.0025	0.0022

firm, thereby reducing entry costs and favouring the formation of a new business. A different mechanism is stressed by Bergin and Corsetti (2013) in the context of a two-sector open economy model with firm entry. Drawing on a relocation externality as in Ossa (2011), they show that countries that specialize away from sectors that produce less differentiated goods towards (high value-added) sectors that produce more differentiated goods, experience an appreciation of their overall terms of trade and therefore an increase in welfare. According to this model, one should observe a positive relation between the terms of trade and external margins, as in our VAR, reflecting an incentive to relocate production in sectors with highly differentiated goods. Looking at the model in Figure 2, the response of intensive margins is not significantly different from zero at all lags. Overall, our results suggest that improvements in the terms of trade increase trade flows mainly along the extensive margin.

We now turn to output shocks. A one standard deviation increase in GDP leads to a contemporaneous increase in extensive margins equal to 0.44% on average. Then, the impulse response slowly converges to zero. A positive response accords with the predictions of entry models stressing an incentive to form a new business when cyclical conditions are favourable. In these models, a domestic cyclical upturn, by leading the expected revenues of new investments above entry costs, encourages the entry of new firms in domestic as well as in foreign markets. Over time, as competition tightens and production costs increase, the attractiveness of start-up investments gradually diminishes. As before, intensive margins hardly react to GDP innovations: the peak response is a tiny $-.04\%$ at the second lag. Intensive margins appear to be mostly driven by their own innovations.

3.2.1 The role or exchange rate regimes

Figures 1 and 2 display the estimated impulse responses for countries with fixed exchange rate regimes (peggers) and for countries with flexible regimes (floaters),

respectively. In both figures, panel A shows the response of extensive margins together with 5% confidence intervals, while panel B shows the responses and 5% confidence intervals for the intensive margins. Since our focus will be on the impact of the exchange rate regime, we also report the estimated coefficients and the confidence intervals of the difference of impulse responses between peggers and floaters in the two models[8] (cf. figure 3).

A major implication of the exchange rate regime concerns the response of extensive margins to terms of trade shocks: on impact the response is on average 0.7% in the sample of peggers and 0.2% in the sample of floaters. The difference between the coefficients of the impulse responses in the two samples remains positive for 2 periods at the 5 percent level before turning negative and converging to zero. A possible reason why fixed exchange rates stimulate trade along the extensive margin is that they help to reduce uncertainty faced by potential exporters. The point was stressed by Russ (2007) in the context of an entry model with multinational firms and by Cavallari (2010) in a model with multinational and export firms. When deciding whether to access foreign markets in the first place, investors strike a balance between expected revenues over the entire investment horizon and (usually sunk) entry costs. Fixed exchange rates, by reducing exchange rate uncertainty, have a positive effect on both sides of the investment decision. This adds a new dimension to the old debate on the choice of the exchange rate regime.

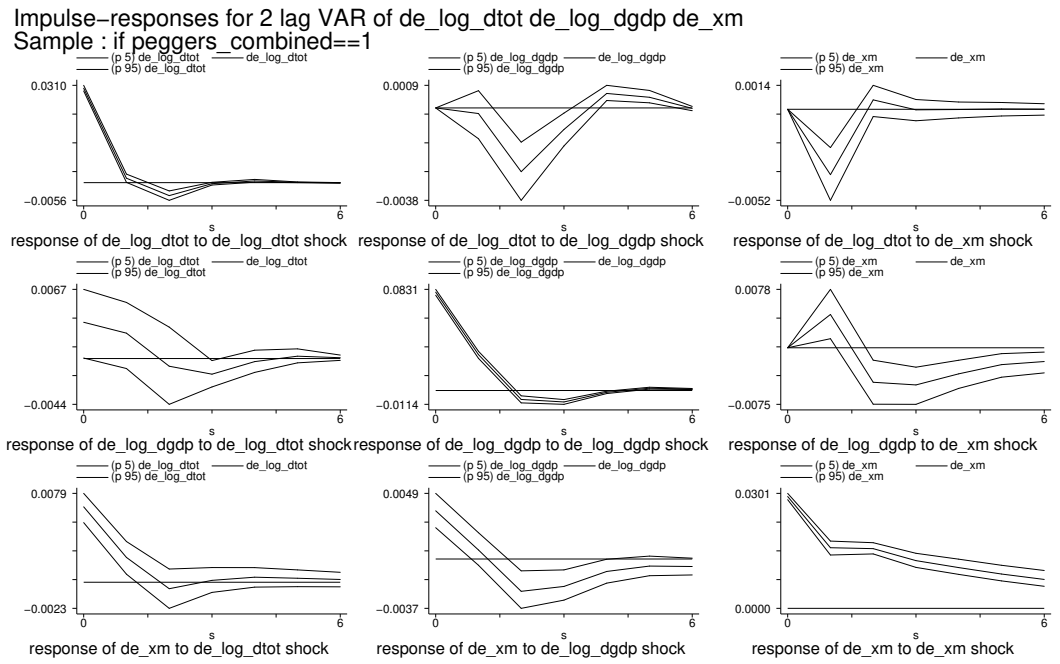
Since Friedman (1953), the advantage typically attributed to flexible exchange rate regimes over fixed regimes is their ability to insulate the economy against real shocks. In a world with sticky prices, the argument goes, changes in the nominal exchange rate allow for larger movements in relative prices that help to smooth adjustment of output to real shocks. In Figure 1, the response of the terms of trade to their own innovations is approximately twice as large in the sample of

[8]As noted by Taylor and Spriggs (1989), since the impulse response function is the moving average representation of the VAR, it consists of an infinite series of normal random variables. We can therefore use the fact that the impulse responses in our two sub-samples are normally distributed at each step, to calculate the confidence intervals and t-statistics of their difference.

Figure 1: Impulse responses peggers

This figure shows the impulse responses to unanticipated shocks for the VAR model in equation (4). The VAR is estimated on the subsample of countries that adopt a fixed exchange rate regime according to the classification in Born et al. (2013). Panel A refers to the model with extensive margins and Panel B to the model with intensive margins. Horizontal axes indicate years. Vertical axes measure percentage deviations from average. Confidence intervals are generated by 500 Monte Carlo replications.

Panel A: Extensive Margins



Panel B Intensive Margins

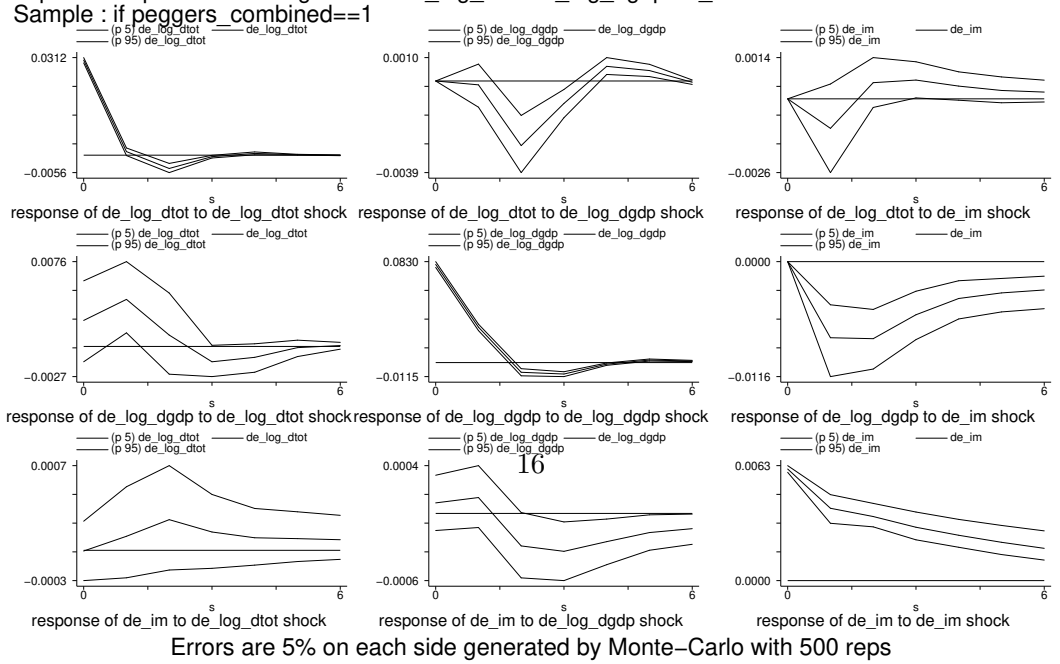
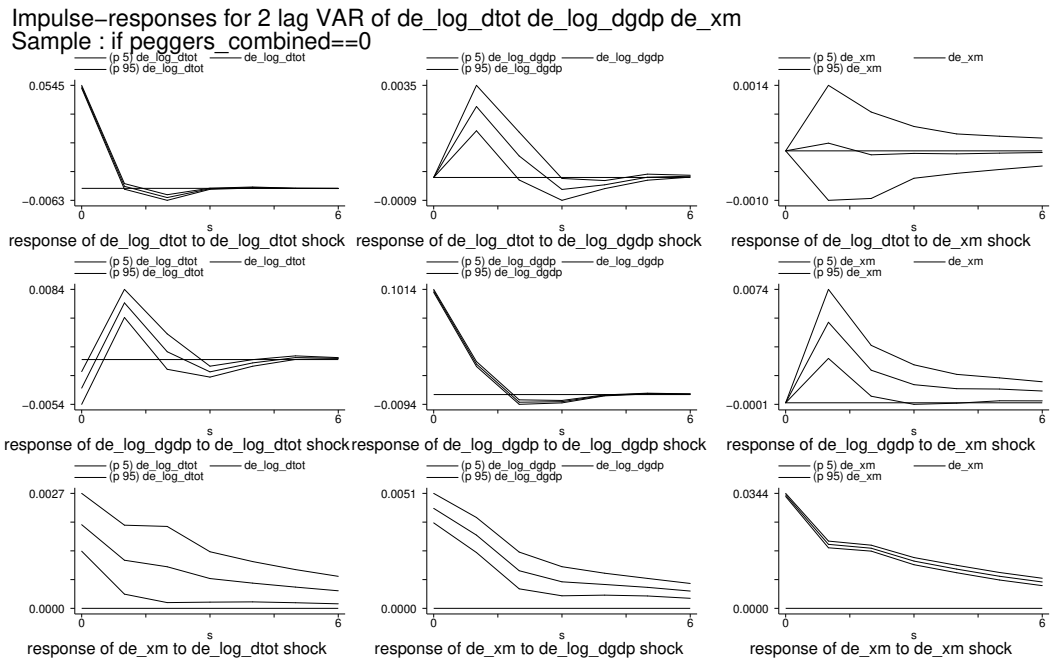


Figure 2: Impulse responses floaters

This figure shows the impulse responses to unanticipated shocks for the VAR model in equation (4). The VAR is estimated on the subsample of countries that adopt a flexible exchange rate regime according to the classification in Born et al. (2013). Panel A refers to the model with extensive margins and Panel B to the model with intensive margins. Horizontal axes indicate years. Vertical axes measure percentage deviations from average. Confidence intervals are generated by 500 Monte Carlo replications.

Panel A: Extensive Margins



Panel B Intensive Margins

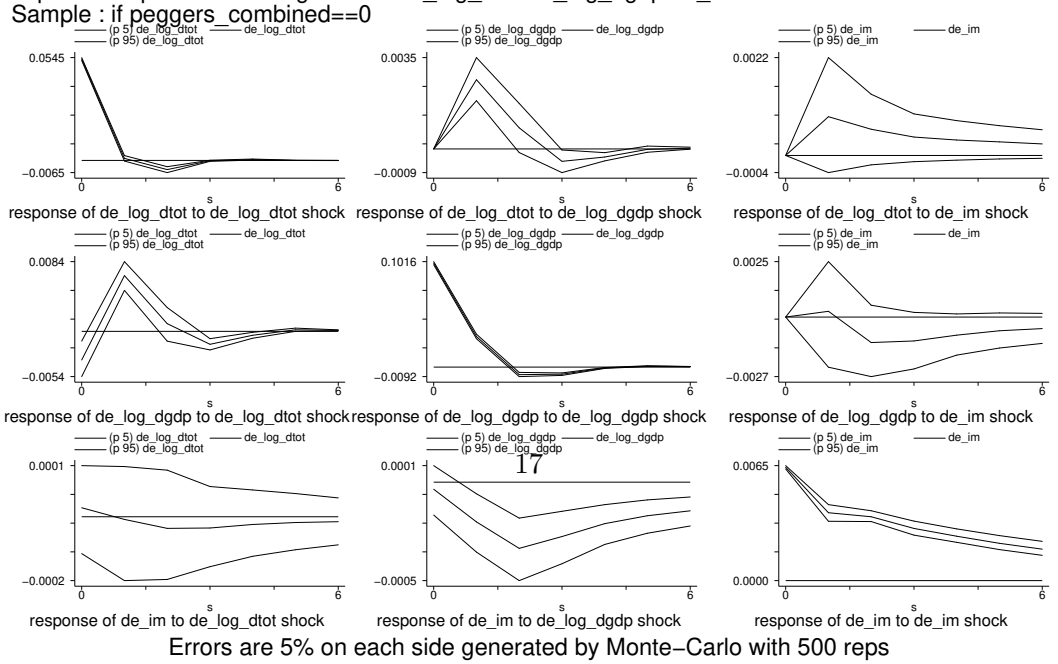
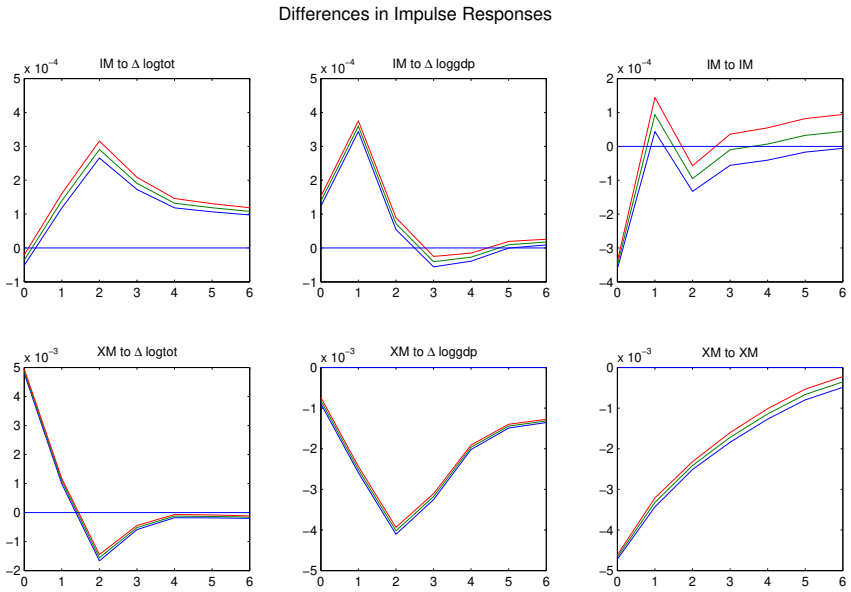


Figure 3:

This figure shows the difference of the impulse responses and the confidence interval between the sub-samples of "peggers" and "floaters". The first row refers to the model with Intensive Margins and the second row to the model with Extensive Margins.



floaters compared to the sample of peggers while the response of GDP is smoother among floaters. These results support the Friedman hypothesis. The response of export margins, however, tells a different story. In floating regimes, exchange rate uncertainty discourages the creation of new trade relations.

In addition, the exchange rate regime affects the impulse responses to output shocks and does so in a direction compatible with the Friedman hypothesis. In order to see why consider the responses of export margins and GDP to GDP innovations (second column of Figures 1 and 2). Extensive margins react less among peggers than among floaters as long as the GDP response is positive (i.e., when cyclical conditions are favourable) and the opposite is true when the GDP response is negative. Consequently, the difference between the coefficients of the impulse responses in the sample of peggers and in the sample of floaters is negative at the 5 percent level in all periods. Our intuition is that output stabilization under floating exchange rate regimes, by reducing macroeconomic uncertainty in the face of output shocks, has a positive effect on the establishment of new trade relations.

Finally, we find that the exchange rate regime has only a negligible impact on incumbent trade relations. In the model with intensive margins, the difference between the impulse responses of peggers and floaters is significant at the 5 percent level only for the first 2 periods, and its magnitude is in the order of 1/100 percentage points.

Our findings are in line with recent evidence documenting that trade flows tend to adjust mainly along the extensive margin in countries that adopt fixed exchange rates.[9] In addition, we provide new evidence on the magnitude of this effect in relation to the type of shocks hitting the economy. We document that the pro-trade effect of fixed exchange rates is strong in the wake of terms of trade (external)

[9]Using panel regressions of disaggregated trade data among European countries, Bergin and Lin (2012) show that extensive margins have responded aggressively to the implementation of the Economic and Monetary Union in Europe (EMU). They find a statistically significant rise in extensive margins already four years ahead of actual EMU adoption, and ahead of any rise in overall trade. The estimated effect of the adoption of the Euro on the intensive margin of trade is, on the contrary, negligible. See also Auray et al. (2012).

shocks. Flexible exchange rates, on the other side, appear to have a positive effect on the creation of new trade relations in response to output shocks. Overall, our results imply that insofar as extensive margins are a relevant portion of trade and external shocks are a major source of business cycle variability, the advantage of flexible exchange rates may be lower than previously thought.

4 Conclusions

This paper investigated how export margins respond to output and terms of trade shocks in different exchange rate regimes using a panel VAR model for 23 OECD economies over the period 1988-2011. The analysis is meant to test the predictions of entry models about the behavior of export margins over the cycle. Furthermore, it provides new evidence on the ability of flexible exchange rates to insulate the economy against real shocks.

First, we show that an improvement in the terms of trade leads to an increase in the extensive margin of trade. The response of the intensive margin of trade is, on the contrary, negligible. We then show that the response of extensive margins is larger in countries that adopt fixed exchange rates compared to countries with flexible exchange rates. This evidence supports the predictions of entry models showing that fixed exchange rates, by reducing the uncertainty faced by potential exporters in the wake of external shocks, favour the establishment of new trade relations.

Second, we find that the extensive margin of exports reacts positively to domestic output shocks as predicted by entry models. The response of internal margins is, instead, negligible. In contrast to what found with external shocks, the response of external margins is stronger in floating regimes. In conclusion, our findings suggest that insofar as extensive margins are a relevant portion of trade and external shocks are a major source of business cycle variability, the advantage of flexible exchange rates may be lower than previously thought.

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